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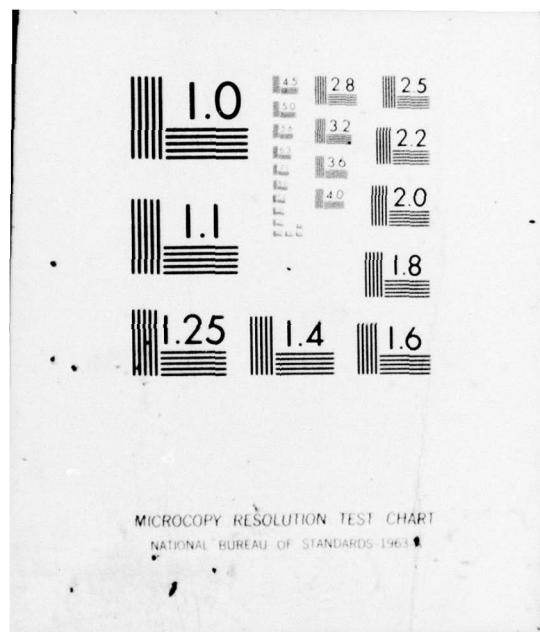
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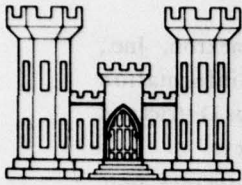
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DREDGED MATERIAL RESEARCH.



U. S. ARMY CORPS OF ENGINEERS
INFORMATION EXCHANGE BULLETIN

Vol D-77-4

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NOTES • NEWS • REVIEWS etc

DISTRIBUTION STATEMENT

Approved for Public Distribution

DDC
PREPARED
MAY 31 1977

A contract study of the effectiveness of Dredged Material Research Program (DMRP) information dissemination activities concluded that modes of transfer relying on interpersonal contacts would be more effective than those relying on printed materials. Thus, the DMRP began about 6 months ago to supplement its widespread publications activities with 1-1/2-day briefings and workshops in each Corps Division area. These have been well attended by both Corps and non-Corps personnel and will continue until the end of the DMRP in March 1978. For additional conclusions and recommendations of the contract study, see the following article.

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DESIGN REQUIREMENTS FOR AN INFORMATION DISSEMINATION AND TECHNOLOGY TRANSFER SYSTEM FOR THE DMRP

The numerous work units within the DMRP encompass an extremely broad range of studies that are multidisciplinary and of interest to many agencies and organizations, and that sometimes involve problems with sensitive social or political implications. For these reasons, the DMRP has been concerned with effectively transmitting* information and results and with coordinating research efforts with other agencies (Figure 1). Briefings, staff coordinators, and publications including technical reports, annual reports, and a monthly bulletin are the main methods the DMRP has used to distribute information.

In order to assess the adequacy of dissemination methods, a contract study (DMRP Work Unit 9A01) was undertaken by Teknekron, Inc., of Washington, DC, to appraise methods in use, to identify additional methods, to survey users and user needs, and to recommend what modes would maximize DMRP technology transfer, particularly upon completion of such a large research program.

* For clarity, three types of transmittal are defined: *information dissemination*, in which information is supplied; *information transfer*, in which information is noted or assimilated; and *technology transfer*, in which information is applied.

During the 18-month study, Teknekron, Inc., evaluated the effectiveness of information dissemination by the DMRP to both Corps District and non-Corps audiences through three surveys.

- *Self-administered questionnaire surveys* were conducted at 12 Districts representing coastal, inland, and other generic categories of dredging locale. The survey sample of over 900 included civilian personnel of GS-09 level or higher and military ranks of first lieutenant and above. This sample was selected on the basis of those organizational affiliations (division and branch) that suggested involvement in dredging operations. Of the total sample, 336 were found to be dredging-assigned. The survey focused primarily on (a) the characterization of the respondents in terms of classification, their use of informational materials and sources, and their job-related attitudes and (b) respondent perceptions of work climate factors that do or may influence District receptivity to new information and technology.
- *Personal interview surveys* were performed at 6 of the above 12 Districts, with the samples drawn from those who had originally participated in the self-administered questionnaire survey. Of 134 interviewees, about 75 percent were assigned to dredging operations and the balance to environmental inventory and assessment. The interviews dealt principally with dredging-related topics and with the participants' assessments of the DMRP bulletin, reports, and program objectives.

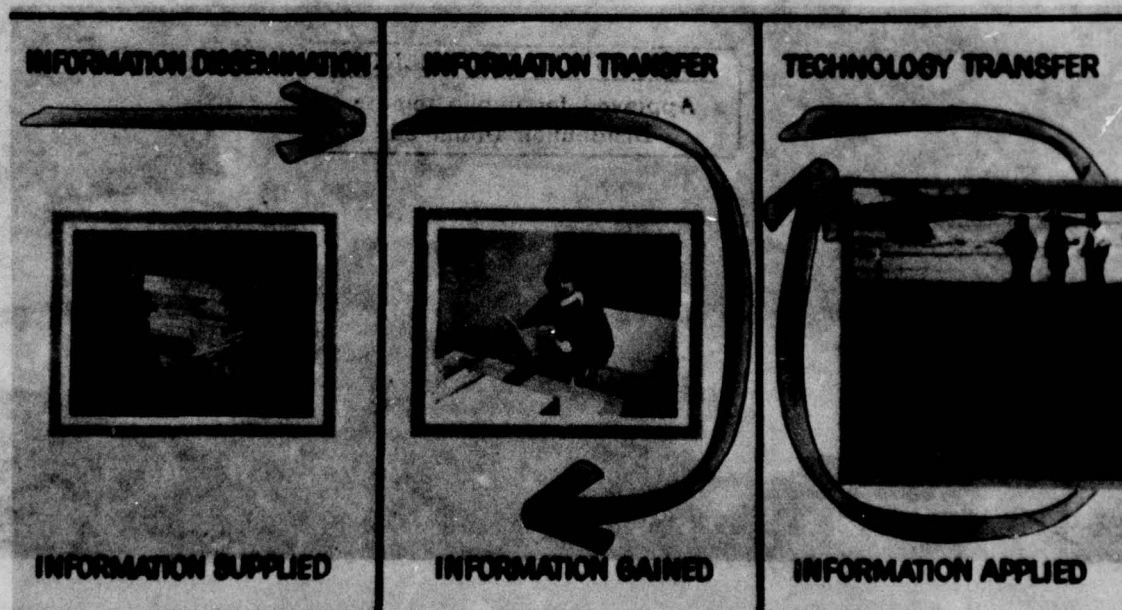


Figure 1. Three types of information transmission close the loop for technology transfer

- Telephone interviews with non-Corps recipients of the DMRP bulletin were conducted nationwide with 100 individuals, most of whom were officials of environmental agencies at all governmental levels. The topical areas addressed in these interviews related chiefly to the respondents' environmental interests, their evaluations of the DMRP bulletin, and their familiarity with the DMRP reports.

CONCLUSIONS

Based on the results of these studies, Teknekron drew the following conclusions.

Information dissemination by the DMRP to Corps Districts is, at present, based largely on the distribution of printed materials, i.e., information exchange bulletins and reports. This method is suitable for those Corps personnel who are inclined toward optional job-related reading. However, these individuals probably constitute no more than 25 percent of the total DMRP audience.

A substantial percentage of the District personnel favor interpersonal modes of learning. This finding is consistent with other survey results and suggests that the supplementation of printed technical materials with verbal tutorial methods, particularly those permitting the free interchange of questions and answers, would significantly augment information transfer within the Districts.

About 86 percent of the personal interview survey respondents exhibited awareness of the existence of the DMRP under conditions of assisted recall. In the case of the participants in the self-administered questionnaire (SA) survey, in which recall assist was not employed, the incidence of awareness of the Program was approximately 28 percent. It was found that SA aware respondents were, on the whole, more inner-directed than the unaware. (Inner-directed individuals tend to be less interpersonally reliant in their work relationships than "other-directed" individuals.)

Knowledge of the scope and content of the DMRP and its information exchange bulletin is considerably less frequent than the mere awareness of these.

Most dredging-assigned personnel are not comprehensive in their dredging interests. They tend to focus on specific areas of direct concern to them. Their reading of dredging-related materials is, accordingly, often quite selective.

The inherent work-related attitudes of the District

personnel are good and offer the potential for high-quality job performance. However, the Districts are not generally perceived as providing climates that encourage either receptivity to new and original ideas from without or the freedom to experiment within. The survey findings show that a high level of innovative capability exists among the District personnel, but this appears to be more frequently exercised in consequence of individual initiative than in the context of organized institutional support.

The areas of principal dissatisfaction of the District personnel relate to their perceived scarcity of opportunities for promotion and advancement. Further, they believe that dependability on the job and cooperation with others are regarded by the District or Divisions as more important factors to be considered in awarding promotions than is contribution to knowledge. These findings do not imply an atmosphere that is conducive either to receptivity to disseminated information or to internal technical innovation.

More than one-half of the participants in the personal interview survey regard the topical areas treated in the DMRP reports as relevant to their informational needs. However, although about 41 percent of these participants had known of at least one report title prior to the survey, somewhat fewer than 22 percent had actually scanned or read more than one report.

The DMRP reports, while obviously required outputs, are not considered in themselves to represent the optimal format for the dissemination and transfer of the Program's research findings and developed methodologies to the District personnel. This assessment is based on several considerations, including:

- The DMRP is, on the whole, generically oriented and the relevance of its research results to informational needs associated with specific projects is frequently not obvious to its audience.
- Each report deals, of necessity, with a particular investigative study. However, information relevant to a given topical area may appear in several different reports. Augmenting this retrieval problem is the fact that the total number of reports to be published by the DMRP on completion of its Program is expected to exceed 150. These factors are likely to discourage routine and frequent use of these documents except by highly motivated personnel.

- District personnel vary considerably with respect to their knowledge of dredging operations and the extent of their technical training and experience. Some of them are likely to experience difficulty in assimilating and applying report information whose level of presentation is relatively sophisticated.

Most dredging-assigned personnel have only a fragmentary knowledge and understanding of dredging operations. This is partly because of their tendency, as mentioned, to focus on areas of special interest and partly because of a relatively high turnover rate among them of 20 percent per 6 months. There is, accordingly, a need, which many of these personnel have expressed, for a comprehensive and simply written dredging primer that would provide a systematic overview of the subject. A broad elementary presentation of this type would also serve as a basis for the better understanding of the more specialized DMRP outputs.

The DMRP bulletin is being disseminated to an appropriate non-Corps audience whose environmental interests are primarily water-quality oriented. These recipients place a relatively high value on the publication and secondary dissemination to other readers (by pass along) is considerable. Non-Corps bulletin recipients exhibit a somewhat greater incidence of familiarity with its topical content than do the District readers. However, many of these recipients are on the bulletin mailing lists at their own requests, so that their interest in the publication is presumably high. Also, their awareness of the existence of the DMRP reports is, on a percentage basis, more widespread than within the Districts. However, their actual knowledge of the technical areas the reports deal with is often vague and inexact.

RECOMMENDATIONS

A broad system approach to the optimization of information transfer is recommended. This approach addresses the Districts as audiences as well as the DMRP information disseminated to them and, for this reason, transcends the scope of the Program in certain areas appropriate for consideration by the Corps as a whole. The suggested overall approach incorporates three key recommendations:

(1) *Enhancement of District Self-Motivation.* There should be a common center established within the Corps for the receipt and subsequent diffusion of

District-developed technology, including innovative applications of DMRP findings. This would assure District personnel that awareness of their more noteworthy technical accomplishments would be disseminated throughout the Corps.

(2) *Self-Perpetuation of DMRP-Developed Technology.* Qualified District teams, to be initially trained by the DMRP staff, should be established within the Districts as disseminative centers for providing required guidance in the application of DMRP technology. The high turnover rate of dredging-assigned personnel, indicated earlier, virtually dictates the requirement for the perpetuation of DMRP information transfer within the Districts to ensure the application and further development of Program-generated technology over the long term. Inasmuch as the DMRP will terminate in March 1978, support from its staff cannot be relied on indefinitely.

(3) *Implementation of DMRP Information Transfer Mechanism.* Independently of any measures that may be adopted for the enhancement and stabilization of the information transfer process within the Districts, there is a need for a DMRP information-transfer mechanism that will both correlate Program-developed technology with local District project requirements and present DMRP technical material in an organized and readily assimilable form without sacrifice of its pertinent information content. This recommendation is based on the study conclusions to the effect that the DMRP reports are not optimal technology transfer media and that the applicability of generic Program outputs to project-specific needs is often not evident.

In addition to suggested system approaches, major specific recommendations are:

(1) The reports should contain summaries of the DMRP technical organization for the orientation of readers who are only partially familiar with the Program, as well as titles of any other reports that are topically related.

(2) The DMRP technical structure should be periodically recapitulated in the bulletin.

(3) Bulletin distribution to the Districts should be more effectively targeted by supplying request forms to the personnel.

(4) The bulletin non-Corps mailing list should be periodically corrected and updated.

(Continued on page 6)

U. S. AND JAPAN DISCUSS DREDGED MATERIAL DISPOSAL

Mr. Charles C. Calhoun, Jr., Manager of the Disposal Operations Project, recently participated in the Second U. S./Japan Expert Meeting on Management of Bottom Sediments Containing Toxic Substances in Tokyo, Japan. The meeting was sponsored by the U. S. Environmental Protection Agency (EPA) and the Japanese Ministry of Transport. The purpose of the meeting was to draw engineers and scientists from the two countries together to discuss research related to the environmental effects of dredged material disposal and improved disposal practices. The group meets once a year with the meeting being rotated

between the United States and Japan. The first meeting was held at the EPA Environmental Research Laboratory at Corvallis, Oregon, in 1975; the DMRP was represented by Dr. R. M. Engler, Manager, Environmental Impacts and Criteria Development Project.

U. S. representatives to the second meeting (in addition to Mr. Calhoun) were Mr. John F. Sustar, San Francisco District, and Drs. A. F. Bartsch, D. J. Baumgartner, S. A. Peterson, and D. Phelps from EPA. Numerous Japanese engineers and scientists from the Government, dredging industry, universities, and other research institutions participated.

A list of the papers presented is shown in Table 1. All papers will be published by EPA and should be

Table 1

PRESENTATIONS AT MEETING ON CONTAMINATED BOTTOM SEDIMENTS

Participant	Title
T. Sameshima	Bureau of Port and Harbours Ministry of Transport
A. F. Bartsch	EPA, Corvallis Environmental Laboratory
T. Ohtsuka	2nd District Port Construction Bureau, Ministry of Transport
A. Murakami	Nansei Regional Fisheries Research Lab., Fisheries Agency, Ministry of Agriculture and Forestry
S. A. Peterson	EPA, Corvallis Environmental Laboratory
H. Egawa	Kumamoto University
S. Tajima	Kumamoto University
K. Murakami	Public Works Research Institute, Ministry of Construction
D. J. Baumgartner	EPA, Corvallis Environmental Laboratory
T. Yoshida	Japan Bottom Sediments Management Association
Y. Ikegaki	Environmental Department Ministry of Transport
J. F. Sustar	U. S. Army Engineer District, San Francisco
S. Fujino	Port and Harbour Bureau, Kitakyushu City
T. Okumura	Port and Harbour Research Institute, Ministry of Transport
C. C. Calhoun	U. S. Army Engineer Waterways Experiment Station
E. Satoh	Japan Reclamation and Dredging Engineering Association
M. Fujiki	Tsukuba University
R. Hirota	Kumamoto University
D. K. Phelps	EPA, Narragansett Environmental Laboratory
Removal Works of Contaminated Bed Sediment in Japan	
Legal and Administrative Aspects of Bottom Sediment Management	
Countermeasures for Pollution in Tokyo Bay	
Organic Pollution of Bottom Mud in the Seto Inland Sea and Its Removal Experiment	
Hydraulic Dredging as a Lake Restoration Technique: Past and Future	
Determination of Trace Amounts of Methylmercury in Seawater	
Behavior of Heavy Metals and PCB's in the Removal and Treatment Operations of Bottom Deposits	
Interchange of Nutrients and Metals Between Sediments and Water During Dredged Material Disposal in Coastal Waters	
Study on the Behaviours of Mercury-Contaminated Sediments in Minamata Bay	
Dredging Conditions Influencing Uptake of Heavy Metals by Organisms	
Covering Work of Disposal Site for Dredged Spoil Containing Mercury	
Stabilizing Effect of Various Chemical Agents to Some Soft Soils	
Dredged Material Densification and Treatment of Contaminated Dredged Material	
A Method for Disposing of Waste Water Derived from Reclamation by Dredging	
The Mechanism of the Methylmercury Accumulation into Fish	
Ecological Considerations in Site Assessment for Dredging and Spoiling Activities	

available shortly. Detailed discussions followed each of the formal presentations. In addition, there was a field trip to the port of Tagonoura where an extensive scheme for the confined disposal of highly contaminated sediments was observed.

After the meeting adjourned, Mr. Calhoun visited the Ministry of Transport Port and Harbor Research Institute and observed and discussed research ongoing in the fields of dredging technology, turbidity control, and dredged material stabilization. Also, he visited the hopper dredge TOKUSHUN-MARU I, which is equipped with an overflow turbidity reduction device (described at WODCON VII). Mr. Calhoun also observed and discussed the performance of dredges developed in Japan for the sole purpose of cleaning up highly contaminated sediments.

The information obtained from the visit will be included in various DMRP synthesis reports.

DMRP TO RENOVATE TWO RUCs FOR SOUTH ATLANTIC DIVISION

As a result of recently completed negotiations between the DMRP Disposal Operations Project (DOP) and the Corps' South Atlantic Division, the DMRP has obtained two excess Riverine Utility Craft (RUCs) from the Marine Corps and will renovate the craft for use by the Charleston District (CDO) and Mobile District (MDO). Operating as DMRP subcontractor, the WES Mobility and Environmental Systems Laboratory will renovate and update the craft to perform required trenching and other activities in confined dredged material disposal areas; evaluate the modified RUCs in disposal areas of the MDO and CDO; train District personnel as RUC operators; and deliver the RUCs with operating manuals, spare parts lists, etc., to the Districts for use in FY 78.

The Division obtained the two RUCs for use in confined dredged material disposal area operation and maintenance resulted from direct requests by the MDO and CDO. Other RUCs can be made available from the Marine Corps for use by CE field elements. Interested parties should contact Mr. C. C. Calhoun, Jr., DOP Manager, or Dr. T. Allan Haliburton, DMRP Geotechnical Engineering Consultant, for further details.

(Continued from page 4)

(5) Recent Final Environmental Impact Statements on dredging projects should be scanned for the names of concerned commentators who may now be unaware of the DMRP, but who might be interested in receiving the bulletin.

(6) A comprehensive primer on dredging and dredging-related operations should be prepared for distribution to the Districts. (This is not a responsibility of the DMRP, but is offered as a suggestion to the Corps in toto.)

The contract manager for the study was Dr. Roger T. Saucier. The report is available as Contract Report D-77-1, Volumes I and II. Volume I discusses the survey method and results and Volume II presents tables of data taken during the surveys.

HEAVY METAL UPTAKE BY SELECTED MARSH PLANT SPECIES

Heavy metal uptake and mobilization by marsh plants grown on dredged material is a major concern of the Habitat Development Project (HDP). The HDP developed Work Unit 4A15 as a preliminary survey of the potential for contaminant uptake by marsh plants. This research was conducted by the Ecosystem Research and Simulation Division, Environmental Effects Laboratory, Waterways Experiment Station.

APPROACH

A greenhouse hydroponic experiment was designed to produce a worst-case situation of heavy metal uptake by marsh plants and provide a general baseline for more detailed follow-up field studies. The eight marsh plant species selected for study included two freshwater plants: *Cyperus esculentus* (Chufa) and *Scirpus validus* (softstem bulrush); two salt-marsh plants: *Spartina alterniflora* (smooth cordgrass) and *Spartina foliosa* (California cordgrass); and four brackish marsh plants: *Scirpus robustus* (saltmarsh bulrush), *Spartina patens* (saltmeadow cordgrass), *Triglochin maritima* (seaside arrowgrass), and *Distichlis spicata* (saltgrass). These plants were collected in natural marshes as seed or plants for propagule stock.

Figure 1 shows the design of the hydroponic system in which the roots of the marsh plants were in contact at all times with chemically controlled solutions containing 0.0, 0.5, or 1.0 ppm of each of the heavy

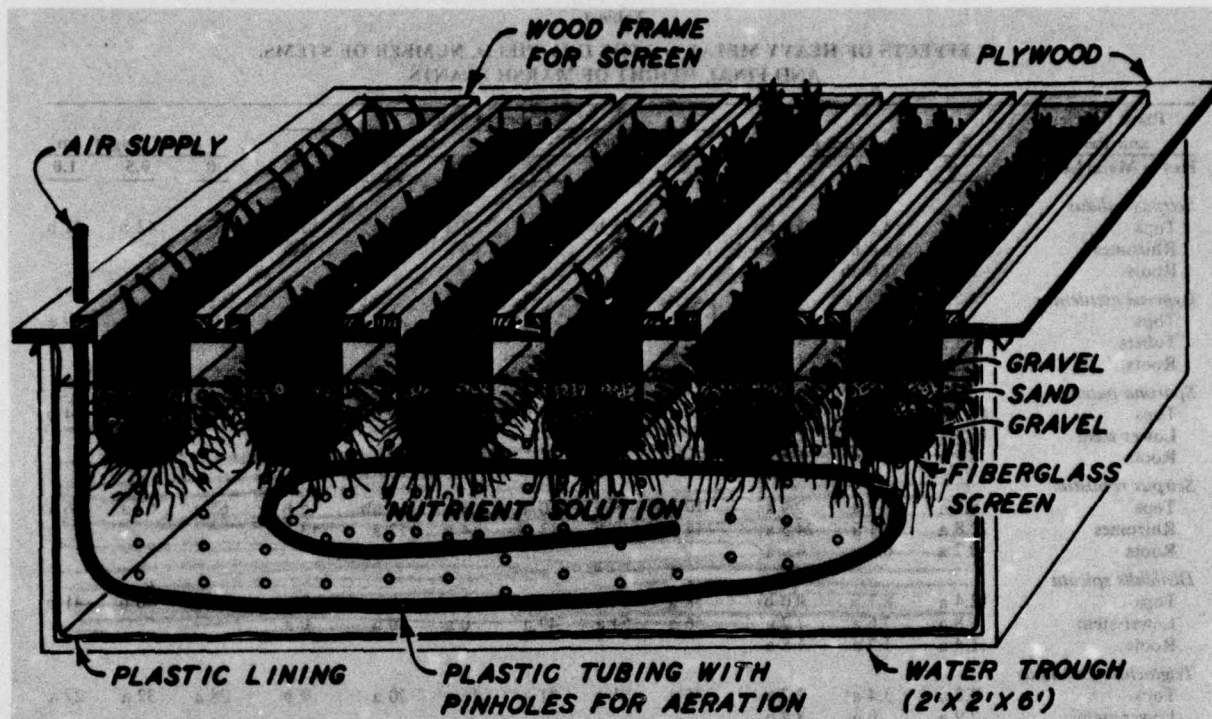


Figure 1. Hydroponic system for heavy metal uptake study

metals zinc, cadmium, nickel, lead, and chromium. Transplants of three sizes were made of each species into hydroponic solutions with differing heavy metals concentrations and salinities. The transplants were exposed to heavy metals for 6 weeks as they grew (Figure 2). At harvest, tops, lower stems, rhizomes, tubers, and roots were analyzed separately for each metal to determine the location of heavy metal accumulations.

RESULTS

The plants were exposed to heavy metals for 6 weeks. Heavy metals appeared to have an effect on the plant growth factors of biomass (oven dry weight), heights, live material, and overall growth. Suppressed weights of tops or roots varied by species as indicated in Table 1, and a reduction of live stems was noted in two species. Three species exhibited a reduction in height. Study results show *S. validus*, *S. patens*, and *D. spicata*, and *S. alterniflora* to all be sensitive to heavy metals, while the other species apparently are not at the tested levels.

Uptake occurred in all species for all five heavy



Figure 2. A planter of *Spartina patens* at harvest, showing root penetration of fiberglass screen

Table 1
EFFECTS OF HEAVY METAL ON THE DRY YIELD, NUMBER OF STEMS,
AND FINAL HEIGHT OF MARSH PLANTS

Plant Species and Parts Heavy Metal Level	Dry Yield, g			Number of Stems						Final Height, cm		
				Live			Dead					
	0	0.5	1.0	0	0.5	1.0	0	0.5	1.0	0	0.5	1.0
<i>Scirpus validus</i>												
Tops	8.2 a	4.5 b	5.0 b	37 a	18 b	16 b	8 a	18 b	15 b	56 a	42 b	42 b
Rhizomes	22.7 a	18.4 b	20.5 ab	121 a	79 b	84 b	46 a	31 b	34 b			
Roots	1.4 a	1.0 ab	0.8 b									
<i>Cyperus esculentus</i>												
Tops	2.5 a	2.3 a	2.4 a	0 a	0 a	0 a	20 a	20 a	20 a	0 a	0 a	0 a
Tubers	8.5 a	8.0 a	8.7 a									
Roots	1.5 a	1.6 a	1.5 a									
<i>Spartina patens</i>												
Tops	41.7 a	37.0 b	25.1 c	248 a	268 a	185 b	0 a	0 a	0 a	74 a	76 a	64 b
Lower stem	15.9 a	15.1 ab	12.7 b									
Roots	8.6 a	8.8 a	6.5 b									
<i>Scirpus robustus</i>												
Tops	8.1 a	8.3 a	9.9 a	10 a	9 a	10 a	3 a	4 ab	5 b	65 a	63 a	66 a
Rhizomes	22.8 a	24.1 a	24.5 a	14 a	12 b	13 ab	14 a	13 a	13 a			
Roots	0.7 a	0.8 a	0.9 a									
<i>Distichlis spicata</i>												
Tops	12.4 a	8.7 b	9.0 b	58 a	46 a	49 a	0 a	0 a	0 a	54 a	46 b	41 b
Lower stem	6.8 a	7.6 a	7.2 a	56 a	54 a	49 a	0 a	0 a	0 a			
Roots	1.4 a	1.2 a	1.8 a									
<i>Triglochin maritima</i>												
Tops	3.2 a	3.4 a	2.7 a	86 a	61 a	81 a	16 a	20 a	9 b	28 a	32 a	27 a
Lower stem	7.9 a	8.0 a	8.4 a									
Roots	5.0 a	4.7 a	5.1 a									
<i>Spartina alterniflora</i>												
Tops	16.4 a	14.3 ab	12.6 b	36 a	32 a	30 a	3 ab	2 a	4 b	53 a	52 a	51 a
Lower stem	5.9 a	6.3 a	6.1 a	44 a	40 a	33 b	0 a	0 a	0 a			
Roots	4.3 ab	5.2 a	3.0 b									
<i>Spartina foliosa</i>												
Tops	11.9 a	9.2 b	11.1 ab	13 ab	8 a	15 b	4 ab	6 a	3 b	49 a	42 a	46 a
Lower stem	7.7 a	6.7 a	7.9 a	8 a	4 a	6 a	0 a	0 a	0 a			
Roots	2.6 a	2.3 a	2.6 a									

NOTE: Means across heavy metal levels within a plant part followed by different letters are significantly different at the 10-percent level of significance.

metals tested; however, relatively little translocation was observed. Accumulated uptake by *S. patens*, a representative species, is shown in Figure 3 for the seven heavy metals at all treatment levels.

C. esculentus, *S. patens*, and *D. spicata* have a greater potential for uptake and translocation of zinc, cadmium, and nickel than the other species studied. *S. alterniflora* and *S. foliosa* rapidly took up these heavy metals but transported very little to plant tops. All eight species accumulated lead and chromium in plant roots with little or no translocation. Levels of phosphorus and iron in roots were closely correlated to the accumulation of all metals except cadmium. The availability and uptake of iron and phosphorus seemed to be a factor in the ability of a marsh plant to take up and translocate certain heavy metals.

RECOMMENDATIONS

Further research is recommended to evaluate the ability of *C. esculentus*, *S. patens*, *D. spicata*, *S. alterniflora*, and *S. foliosa* to absorb and accumulate heavy metals from dredged material under various laboratory and field conditions. Since heavy metal absorption and accumulation are time-dependent, longer periods of exposure than those in the reported study are recommended.

The report of the hydroponic study was written by Charles R. Lee, Thomas C. Sturgis, and Mary C. Landin as part of Task 4A, Marsh Development, of the Habitat Development Project of the DMRP (Dr. Hanley K. "Bo" Smith, Manager). The report, Technical Report D-76-5, is currently available.

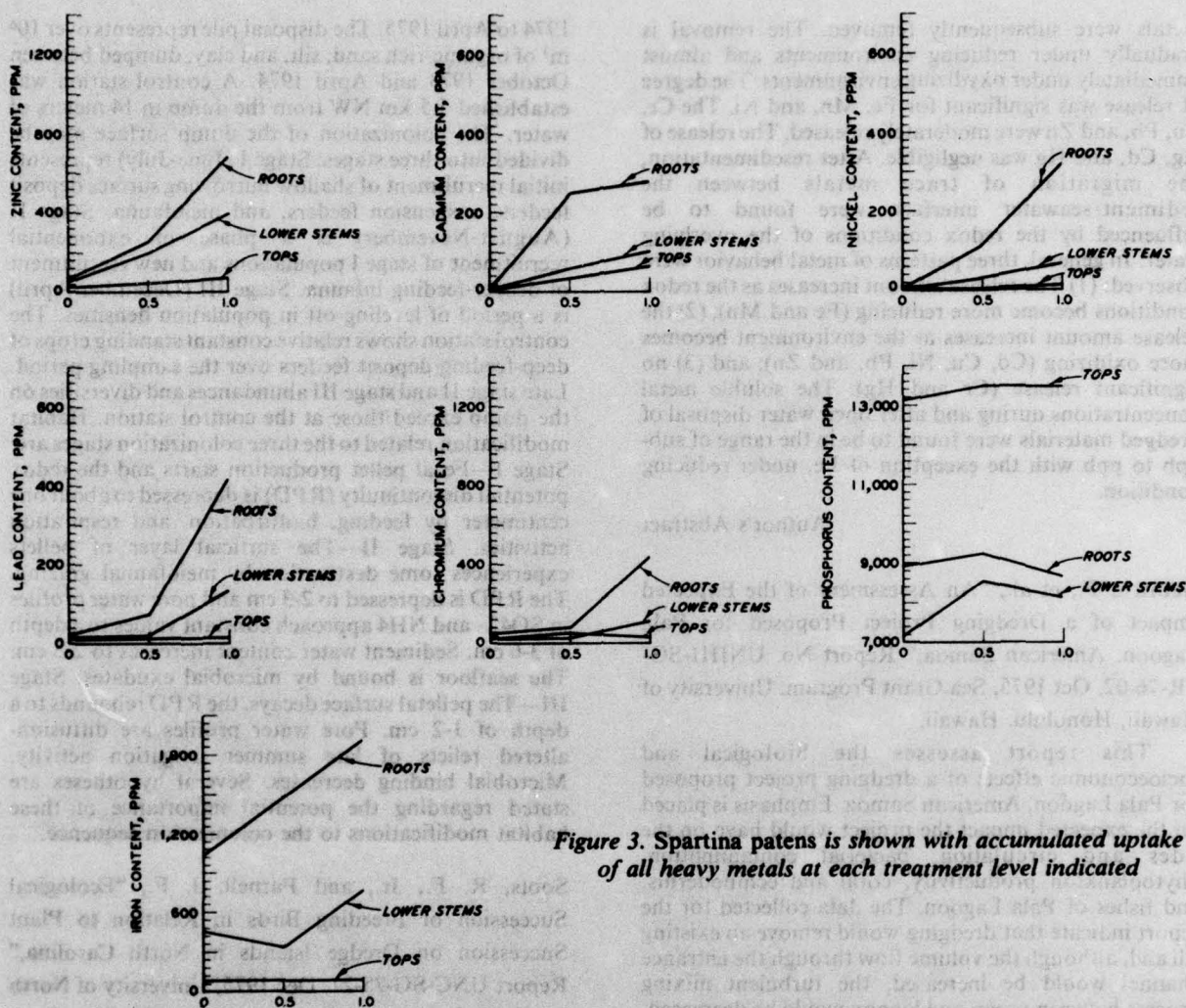


Figure 3. *Spartina patens* is shown with accumulated uptake of all heavy metals at each treatment level indicated

NEW LITERATURE

Soule, D. F. and Oguri, M., ed., "Marine Studies of San Pedro, California; Part II, Potential Effects of Dredging on the Biota of Outer Los Angeles Harbor; Toxicity, Bioassay and Recolonization Studies," June 1976, Allan Hancock Foundation and the Institute of Marine and Coastal Studies, University of Southern California, Los Angeles, California.

Main sections of the report include (1) potential ecological effects of hydraulic dredging in Los Angeles Harbor: an overview, by D. F. Soule and M. Oguri; (2) resuspended sediment elutriate studies on the northern anchovy, by G. D. Brewer; (3) effects of Los Angeles Harbor sediment elutriate on the California killifish, *Fundulus parvipinnis* and white croaker, *Genyonemus lineatus*, by D. W. Chamberlain; (4) toxicity and heavy

metals in three species of crustacea from Los Angeles Harbor sediments, by J. R. McConaughy; (5) bioassay and heavy metal uptake investigations of resuspended sediment on two species of polychaetous annelids, by R. R. Emerson; (6) biomass and recolonization studies in the outer Los Angeles Harbor, by D. F. Soule; and (7) water quality evaluation of dredged material disposal from Los Angeles Harbor, by K. Y. Chen and C.-C. Wang.

Chen, K. Y., et al., "Trace Metals in Open Water Disposal of Dredged Material," *Journal of the Waterways, Harbors and Coastal Engineering Division, ASCE*, Vol 102, No. WW4, Proceedings Paper 12546, Nov 1976, pp 443-454.

Upon addition of sediment/seawater mixture to the seawater column, most trace metals were found to display a pattern of immediate release. These released

metals were subsequently removed. The removal is gradually under reducing environments and almost immediately under oxidizing environments. The degree of release was significant for Fe, Mn, and Ni. The Cr, Cu, Pb, and Zn were moderately released. The release of Ag, Cd, and Hg was negligible. After resedimentation, the migration of trace metals between the sediment/seawater interface were found to be influenced by the redox conditions of the overlying water. In general, three patterns of metal behavior were observed: (1) The release amount increases as the redox conditions become more reducing (Fe and Mn); (2) the release amount increases as the environment becomes more oxidizing (Cd, Cu, Ni, Pb, and Zn); and (3) no significant release (Cr and Hg). The soluble metal concentrations during and after open water disposal of dredged materials were found to be in the range of sub-ppb to ppb with the exception of Fe, under reducing condition.

Author's Abstract

Helfrich, P., et al., "An Assessment of the Expected Impact of a Dredging Project Proposed for Pala Lagoon, American Samoa," Report No. UNIHI-SG-TR-76-02, Oct 1975, Sea Grant Program, University of Hawaii, Honolulu, Hawaii.

This report assesses the biological and socioeconomic effects of a dredging project proposed for Pala Lagoon, American Samoa. Emphasis is placed on the expected impact the project would have on the tides and circulation, bacterial contamination, phytoplankton productivity, coral and echinoderms, and fishes of Pala Lagoon. The data collected for the report indicate that dredging would remove an existing sill and, although the volume flow through the entrance channel would be increased, the turbulent mixing process between ocean and lagoon would be decreased, and, as a result, the average residence time of water in the lagoon would be increased. Since the dredging is not believed to enhance the effective tidal dilution, this project is not expected to improve the microbial quality of the lagoon. The report also stresses that any perturbations affecting the coral (such as dredging) can be expected to have a profound effect on the rest of the community for an extended period. The report states that increased residence time of water in the lagoon, caused by dredging, would be detrimental to delicate fish larvae.

Rhoads, D. C., et al., "Influence of Colonizing Benthos on Physical Properties and Chemical Diagenesis of the Estuarine Seafloor," Unnumbered report, 1975, Department of Geology and Geophysics, Yale University, New Haven, Connecticut.

Two sampling stations were established on the top and edge of a newly dumped dredged material deposit in 12 and 18 meters of water in central Long Island Sound. These stations were sampled periodically from June

1974 to April 1975. The disposal pile represents over 10^6 m³ of organic-rich sand, silt, and clay, dumped between October 1973 and April 1974. A control station was established 5.5 km NW from the dump in 14 meters of water. The colonization of the dump surface may be divided into three stages: Stage I (June-July) represents initial recruitment of shallow burrowing surface deposit feeders, suspension feeders, and meiofauna. Stage II (August-November) is a phase of exponential recruitment of stage I populations and new recruitment of deeper-feeding infauna. Stage III (December-April) is a period of leveling-off in population densities. The control station shows relative constant standing crops of deep-feeding deposit feeders over the sampling period. Late stage II and stage III abundances and diversities on the dump exceed those at the control station. Habitat modification related to the three colonization stages are: Stage I—Fecal pellet production starts and the redox potential discontinuity (RPD) is depressed to about one centimeter by feeding, bioturbation, and respiration activities. Stage II—The surficial layer of pellets experiences some destruction by meiofaunal grazing. The RPD is depressed to 2-3 cm and pore water profiles in SO₄²⁻ and NH₄ approach constant values to a depth of 3-6 cm. Sediment water content increases to 2-3 cm. The seafloor is bound by microbial exudates. Stage III—The pelletal surface decays, the RPD rebounds to a depth of 1-2 cm. Pore water profiles are diffusion-altered relicts of late summer irrigation activity. Microbial binding decreases. Several hypotheses are stated regarding the potential importance of these habitat modifications to the colonization sequence.

Soots, R. F., Jr., and Parnell, J. F., "Ecological Succession of Breeding Birds in Relation to Plant Succession on Dredge Islands in North Carolina," Report UNC-SG-75-27, Dec 1975, University of North Carolina Sea Grant Program, North Carolina State University, Raleigh, North Carolina.

Utilization of man-made dredge islands by nesting birds in relation to the seral stages of plant succession was examined in estuaries of North Carolina. Seral stages were sparse forb, dense forb, forb-shrub, shrub thicket, shrub forest, and young maritime forest. A succession of breeding birds were associated with vegetative changes. Earliest stages of plant succession, characterized by sparse forbs, were utilized primarily by ground-nesting members of the Charadriiformes. Most important nesting birds of shrub thickets, shrub forests, and developing maritime forests characteristic of later stages of plant succession were members of Cinchoniformes. Pattern of plant succession was influenced on some islands by birds. Frequent dredging and periodic redeposition of dredged material on some of existing islands maintained early stages of succession necessary for many species. Evidence indicated that populations of many species were increasing—perhaps primarily due to favorable nesting habitat provided by dredge islands.

(Continued on page 12)

NEW DMRP PUBLICATIONS

Green, Charles E., and Rula, Adam A., "Inventory and Evaluation of Low-Ground Pressure Construction Equipment for Use in Dredged Material Containment Area Operation and Maintenance; Report 1, Equipment Inventory," Technical Report D-77-1 (Appendices A and B on microfiche*), April 1977, prepared by the Mobility and Environmental Systems Laboratory for the Environmental Effects Laboratory, U. S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. (Final Report on Work Unit 2C09.)

Barko, John W., et al., "Establishment and Growth of Selected Freshwater and Coastal Marsh Plants in Relation to Characteristics of Dredged Sediments," Technical Report D-77-2, March 1977, Environmental Effects Laboratory, U. S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. (Final Report on Work Unit 4B06.)

Shuba, Peter J., Carroll, Joe H., and Wong, Karon L., "Biological Assessment of the Soluble Fraction of the Standard Elutriate Test," Technical Report D-77-3, March 1977, Environmental Effects Laboratory, U. S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. (Final Report on Work Unit 1E06.)

Johnson, Stanley Jr., et al., "State-of-the-Art Applicability of Conventional Densification Techniques to Increase Disposal Area Storage Capacity," Technical Report D-77-4 (Appendices A-C on microfiche*), April 1977, prepared by the Soils and Pavements Laboratory for the Environmental Effects Laboratory, U. S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. (Final Report on Work Unit 5A03.)

Speaker, David M., and Weisgerber, William H., "Design Requirements for an Information Dissemination and Technology Transfer System for the Dredged Material Research Program," Contract Report D-77-1 (Appendix B on microfiche*), February 1977, prepared by Teknekron, Inc., for the Environmental Effects Laboratory, U. S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. (Final Report on Work Unit 9A01.)

Coastal Zone Resources Corp., "A Comprehensive Study of Successional Patterns of Plants and Animals at Upland Disposal Areas," Contract Report D-77-2, March 1977, prepared for the Environmental Effects Laboratory, U. S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. (Final Report on Work Unit 5B03.)

Garbish, E. W., Jr., "Recent and Planned Marsh Establishment Work Throughout the Contiguous United States—A Survey and Basic Guidelines," Contract Report D-77-3 (Appendix B on microfiche*), April 1977, prepared by Environmental Concerns, Inc., for the Environmental Effects Laboratory, U. S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. (Final Report on Work Unit 4A25.)

Khalid, R. A., et al., "Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH; Volume I, Literature Review; Volume II, Materials and Methods/Results and Discussion," Contract Report D-77-4, April 1977, prepared by the Louisiana Agricultural Experiment Station, Louisiana State University, for the Environmental Effects Laboratory, U. S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. (Final Report on Work Unit 1C05.)

NOTE: Copies of the above reports will be furnished to individual requestors as long as supplies last. Since it is only feasible to print a limited number of copies, requests for single rather than multiple copies by a single office will be appreciated. Please address all requests to the Waterways Experiment Station, ATTN: Ms. D. P. Booth. When supplies are exhausted, copies will be obtainable from the National Technical Information Service, 5205 Port Royal Road, Springfield, Va. 22151.

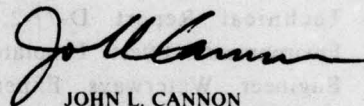
* Microfiche enclosed in envelope in back of report.

Terry, O. W., et al., "Tidal Marsh Restoration at Hempstead, Long Island," *Shore and Beach*, Vol. 42, No. 2, Oct 1974, pp 36-39.

In a cooperative effort between the Town of Hempstead and the New York State Sea Grant Program, a pilot project in marsh planting was carried out along a backfilled trench excavated to lay a sewer outfall pipeline across an area of natural tidal marsh. Seeds, seedlings, and plugs of *Spartina alterniflora* were planted in a series of test plots, all with some degree of success. Seedlings gave the best results and overall survival is estimated at better than 50 percent. Survival and growth variations were apparently related to tidal elevation and substrate composition which varied from clean sand to organic silt. In all planting methods, the success was better on the higher and coarser sediments. Previous observation suggests the degree of cover achieved in one year by planting would have developed naturally by colonization in perhaps 5 years. The authors concluded the use of seedlings is most widely applicable, success would be better on better substrates, and that a local seed source is probably not a major consideration. Success of the effort helped lend support to the plans of several towns in the area to revegetate dredged material disposal areas with *Spartina*.

NOTE: The DMRP regrets it cannot be a distributing agent for the new items of literature listed in this newsletter. All items presented are available at the time of listing from the publishing or issuing agency and requests for copies should be addressed to them. In many instances, only limited copies are available and the use of Interlibrary Loan or related services is encouraged.

This bulletin is published in accordance with AR 310-2. It has been prepared and distributed as one of the information dissemination functions of the Environmental Effects Laboratory of the Waterways Experiment Station. It is principally intended to be a forum whereby information pertaining to and resulting from the Corps of Engineers' nationwide Dredged Material Research Program (DMRP) can be rapidly and widely disseminated to Corps District and Division offices as well as other Federal agencies, State agencies, universities, research institutes, corporations, and individuals. Contributions of notes, news, reviews, or any other types of information are solicited from all sources and will be considered for publication as long as they are relevant to the theme of the DMRP, i.e., to provide—through research—definitive information on the environmental impact of dredging and dredged material disposal operations and to develop technically satisfactory, environmentally compatible, and economically feasible dredging and disposal alternatives, including consideration of dredged material as a manageable resource. This bulletin will be issued on an irregular basis as dictated by the quantity and importance of information to be disseminated. Communications are welcomed and should be addressed to the Environmental Effects Laboratory, ATTN: R. T. Saucier, U. S. Army Engineer Waterways Experiment Station, P. O. Box 631, Vicksburg, Miss. 39180, or call AC 601, 636-3111, Ext. 3233.



JOHN L. CANNON
Colonel, Corps of Engineers
Commander and Director

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